PATENT ABSTRACTS OF JAPAN

(11)Publication number : **11-298907**

(43)Date of publication of application : **29.10.1999**

(51)Int.CI. **H04N 9/04**
A61B 1/04
G02B 23/24
H04N 5/225
H04N 7/18
H04N 9/73

(21)Application number : **10-099145**

(22)Date of filing : **10.04.1998**

(71)Applicant : **ASAHI OPTICAL CO LTD**

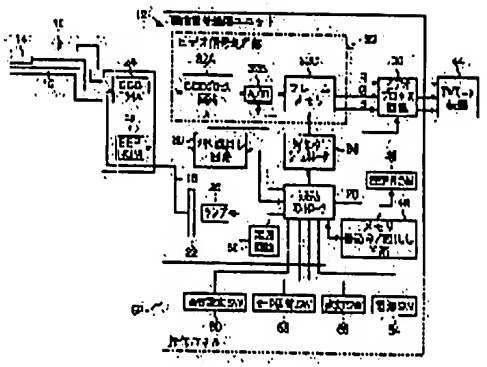
(72)Inventor : **ENOMOTO TAKAYUKI**

(54) ELECTRONIC ENDOSCOPE SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electronic endoscope system, consisting of pluralities of scopes and an image signal processing unit to which arbitrary scope can be connects selectively and removably and that applies proper white balance processing to a pixel signal obtained from each connected scope.

SOLUTION: Each scope 10 is provided with a solid-stage image-pickup means 14. Each scope is provided with a memory 26 that stores information data to identify each scope itself, and an image signal processing unit 12 is provided with a memory 46 that stores white balance correction coefficient data, corresponding to the information data for each scope. When an optional scope is connected to the unit 12, the unit 12 reads information data from the memory 26 to discriminate whether or not the data corresponding to the information data are stored in the memory 46. When the unit 12 discriminates that the memory 46 has the data corresponding to the information data, the unit 12 applies white balance processing to a pixel signal from the solid-state image- pickup means 14, based on the white balance correction coefficient data.



LEGAL STATUS

[Date of request for examination]	19.12.2001
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It is the electronic endoscope system which consists of two or more scopes and the picture signal processing unit which it may have came to connect free [attachment and detachment of each of these scopes]. The solid-state image pck-up means for making a pixel signal carry out photo electric translation of the optical photographic subject image to each aforementioned scope is established. In the electronic endoscope system with which the video signal processing means for generating a video signal based on the aforementioned pixel signal is prepared in the aforementioned picture signal processing unit A scope side memory means to store the scope specific information data for each aforementioned scope specifying it confidence is provided. A unit side memory means by which the aforementioned picture signal processing unit stores the white balance correction-factor data corresponding to scope specific information data and each scope specific information data about each of two or more aforementioned scopes, When arbitrary scopes are connected to the aforementioned picture signal processing unit, scope specific information data are read from the scope side memory means. A distinction means to distinguish whether the thing applicable to the read-out scope specific information data is stored in the aforementioned unit side memory means is included. When what corresponds to the aforementioned read-out scope specific information data by the aforementioned distinction means was stored in the aforementioned unit side memory means and it is distinguished, The electronic endoscope system characterized by performing white balance processing based on the white balance correction-factor data corresponding to the scope specific information data to the pixel signal acquired from the solid state image pickup device of the scope of the aforementioned arbitration.
[Claim 2] In the electronic endoscope system according to claim 1, the date which stored each white balance correction-factor data of two or more aforementioned scopes in the aforementioned unit side memory means is stored in this unit side memory means as a registration day. When arbitrary scopes are connected to the aforementioned picture signal processing unit, scope specific information data are read from the scope side memory means. When the thing applicable to the read-out scope specific information data was stored in the aforementioned unit side memory means and it is distinguished by the aforementioned distinction means, When a days operation means to calculate the difference during the connection day and the aforementioned registration day which connected the scope of the aforementioned arbitration to the aforementioned picture signal processing unit, and the difference calculated according to this days operation are beyond predetermined values, The electronic endoscope system characterized by establishing a white balance reconfiguration information means to report the purport which should reconfigure the white balance correction-factor data to the scope of the aforementioned arbitration.

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the electronic endoscope system which consists of two or more scopes and the picture signal processing unit which it may have came to connect free [attachment and detachment of each of these scopes].
[0002]
[Description of the Prior Art] In an electronic endoscope system which was mentioned above, the scope of various types, for example, the scope for gastrocamera, the scope for bronchial tubes, the scope for the large intestines, etc. are used, and, now, it is at least 200 as the kind. Beyond the kind is known. each scope as everyone knows -- flexibility -- it is constituted as a conduit, a solid-state image pickup device, for example, CCD (charge coupled device) image sensors, is prepared in the distal end of the scope, and this CCD series is combined with an objective lens system Moreover, the light guide for lighting which consists of an optical fiber bundle is made to insert in in this scope, the end face of the point is located in the distal end of the scope of an electronic endoscope, and the other-end section is located in the juxtaposition edge of a scope. If a scope is connected to a picture signal processing unit, the light guide for lighting will be optically connected to the light source lamp formed in this picture signal processing unit.
[0003] At the time of insertion of the scope into a patient's coelome, it is the front of the objective lens system by the side of the distal end from the point end face of a light guide to injection light, it has, and is illuminated, and image formation of the photographic subject image caught by the objective lens system by this is carried out to the light-receiving side of CCD series, and photo electric translation is carried out as a pixel signal there. The pixel signal acquired with CCD series is sent to the video signal processing circuit in a picture signal processing unit, after receiving a predetermined image processing, for example, white balance processing, a gamma correction, profile emphasis processing, etc. there, it is outputted to TV monitoring device as a video signal, and an optical endoscope image is reproduced there.
[0004] By the way, the number of pixels of the CCD series used with each scope and the frequency of the clock pulse for processing of a pixel signal differ from the correction factor for white balance processing etc. according to the kind of scope. Then, in the former, non-volatile memory (EEPROM), for example, the memory only for read-out in which a rewrite is possible, is prepared in each scope. The number data of pixels peculiar to each scope, the frequency data of a clock pulse, the correction-factor data for white balance processing, etc. are stored there. Whenever each scope is connected to a picture signal processing unit, every, the system controller in this picture signal processing unit reads the data in the non-volatile memory of this scope. It is made to process the pixel signal from the CCD series of each scope based on these data.

[0005]
[Problem(s) to be Solved by the Invention] However, if it is in the conventional electronic endoscope system which was mentioned above, the problem that especially white balance processing cannot carry out proper is pointed out. If it explains in full detail, when each scope will be shipped from works, each scope is connected to the criteria picture signal processing unit called master picture signal processing unit, a setup of the correction factor for white balance processing is performed there, and the correction-factor data is written in the non-volatile memory of this scope. However, though an optical property etc. is not necessarily in agreement between the picture signal processing unit by the side of a user, and a criteria picture signal processing unit and white balance processing is performed in the picture signal processing unit by the side of a user based on the correction-factor data of each scope, the white balance processing is the optimal.
[0006] Moreover, although the correction factor for white balance processing is deeply related to the color temperature property of the light source lamp of each picture signal processing unit especially, the color temperature property of this light source lamp itself also has the problem of changing with time with the degradation.
[0007] In order to, always perform proper white balance processing proper in short, it is necessary to perform periodically a correction-factor setup for white balance processing, and to update it about each picture signal processing unit by the side of a user.
[0008] Therefore, the purpose of this invention is an electronic endoscope system which consists of two or more scopes and the picture signal processing unit which it may have came to connect free [attachment and detachment of each of these scopes], and is offering the electronic endoscope system which can guarantee the proper white balance processing to the pixel signal acquired with each scope.
[0009]
[Means for Solving the Problem] The electronic endoscope system by this invention consists of two or more scopes and a picture signal processing unit which it may have came to connect free [attachment and detachment of each of these scopes], the solid-state image pck-up means for making a pixel signal carry out photo electric translation of the optical photographic subject image to each scope is established, and the video signal processing means for generating a video signal based on a pixel signal is prepared in a picture signal processing unit. Each scope possesses a scope side memory means to store the scope specific information data for specifying it confidence. A unit side memory means by which a picture signal processing unit stores the white balance correction-factor data corresponding to scope specific information data and each scope specific information data about each of two or more scopes, When arbitrary scopes are connected to a picture signal processing unit, scope specific information data are read from the scope side memory means, and a distinction means to distinguish whether the thing applicable to the read-out scope specific information data is stored in the unit side memory means is provided. the pixel signal acquired from the solid state image pickup device of arbitrary scopes when what reads by the distinction means and corresponds to scope specific information data was stored in the unit side memory means and it was distinguished -- receiving -- the scope mystery e -- white balance processing based on the white balance correction-factor data corresponding to information data is performed four e4e4e4e4e4e4e4e4c1 law
[0010] If it is in the electronic endoscope system by this invention, the date which stored each white balance correction-factor data of two or more scopes in the unit side memory means preferably is stored in this unit side memory means as a registration day. In this case, when arbitrary scopes are connected to a picture signal processing unit, scope specific information data are read from the scope side memory means. When the thing applicable to the read-out scope specific information data was stored in the unit side memory means and it is distinguished by the distinction means, When a days operation means to calculate the difference during the connection day and registration day which connected arbitrary scopes to the picture signal processing unit, and the difference calculated according to this days operation are beyond predetermined values, A white balance reconfiguration information means to report the purport which should reconfigure the white balance correction-factor data to arbitrary scopes is established.

[0011] Moreover, in the electronic endoscope system by this invention, when what reads by the distinction means and corresponds to scope specific information data was not stored in the unit side memory means and it is distinguished, a non-registered information means to report the purport which has not registered arbitrary scopes may be established.
[0012] furthermore, it was stored in the unit side memory means in the electronic endoscope system by this invention -- each of scope specific information data may be stored also in the scope side memory means of an applicable scope at least
[0013]
[Embodiments of the Invention] Next, 1 operation gestalt of the electronic endoscope system by this invention is explained with reference to an accompanying drawing.
[0014] Reference of drawing 1 shows the electronic endoscope used with the electronic endoscope system by this invention as a block diagram. an electronic endoscope -- flexibility -- the scope 10 which consists of a conduit is provided and this scope 10 is connected to the picture signal processing unit 12 called processor free [attachment and detachment] CCD series 14 is formed, the point, i.e., the distal end, of a scope 10, this CCD series 14 is combined with an objective lens system (not shown), and the photographic subject image taken by this objective lens system is made it to carry out image formation to the light-receiving side of CCD series 14.
[0015] Moreover, the light guide 16 which consists of an optical fiber bundle is made to insert in in a scope 10, and the distal end of this light guide 16 is prolonged to the distal end of a scope 10. The juxtaposition edge of a light guide 16 is connected to the outside edge of the light guide 18 in this picture signal processing unit 12 at the time of connection of the scope 10 to the picture signal processing unit 12, and the inside edge of a light guide 18 is optically connected to light source lamps, such as a halogen lamp or a xenon lamp. Since an electronic endoscope consists of these operation gestalten so that the color image by the field serial mode can be reproduced, between the light source lamp 20 and the inside edge of a light guide 18, the rotating type RGB light filter 22 is made to intervene as a rotating type three-primary-colors light filter. The light from the light source lamp 20 is made to condense with the condenser lens which is not illustrated by the inside end face of a light guide 18.
[0016] In addition, the rotating type RGB light filter 22 is rotated by the predetermined rotational frequency according to TV image reappearance method adopted with an electronic endoscope. For example, when the PAL system is adopted, the rotational frequency of the rotating type RGB light filter 22 is 25Hz, an NTSC color TV system is adopted and the rotational frequency is set to 30Hz at a ****** case.
[0017] If it states concretely, the rotating type RGB light filter 22 consists of a disk element, and this disk element is divided into six sector fields toward a periphery from the center, and every other three 1 sector fields in these sector field will be made into a shading field, and let other three sector fields be a red filter, a green filter, and a blue filter, respectively. If the rotating type RGB light filter 22 is rotated by 30Hz (NTSC color TV system), the time which the one rotation takes is about 33.3ms (1/30sec). It becomes and the lighting time in the filter of each color is set to about 33.3 / 6ms. The red light from an end face, the green light, and the blue glow of a distal end of a light guide 16 are 33.3ms (1/30sec) of **. It is made to inject one by one only for about 33.3 / 6ms in between, and a photographic subject has by red light, green light, and the blue glow, it is illuminated one by one, and image formation of the photographic subject image of each of that color is carried out to the light-receiving side of CCD series 14 one by one.
[0018] CCD series 14 carries out photo electric translation of the optical photographic subject image of each color by which image formation was carried out to the light-receiving side to the analog pixel signal for one frame, and the analog pixel signal for one frame of each of that color is read from CCD series 14 one by one for the next shading time (33.3/6ms) following the lighting time (33.3/6ms) of each color. Read-out of the analog pixel signal from CCD series 14 is performed by the CCD driver circuit 24 prepared in the scope 10 side. In addition, although the lighting time by red light, green light, and the blue glow should differ somewhat, respectively since the output power of each color from a light filter 22 differed from the spectral sensitivity characteristic of CCD series 14 when said strictly, read-out of the analog pixel signal for one frame of each color from CCD series 14 is

performed within the same shading time.
[0019] Moreover, it is prepared, suitable non-volatile memory (EEPROM) 26, for example, memory only for read-out in which a rewrite is possible, for a scope 10 side, and the various information about CCD series 14 built into the scope 10 is written in this EEPROM26. For example, the frequency information on the clock pulse at the time of processing the analog picture signal read with the number data of pixels of CCD series 14 and the CCD driver circuit 24 etc. is stored in EEPROM26, and the scope specific information data, for example, the scope name data, and serial number data for specifying scope 10 the very thing are further mentioned to it as information data especially relevant to this invention.
[0020] A system controller 28 is formed in the picture signal processing unit 12, and this system controller 28 consists of microcomputers. That is, a system controller 28 consists of the memory (RAM) and the input/output interface (I/O) which store temporarily the memory (ROM) only for read-out which stores the program for performing a central-process unit (CPU) and various routines, a constant, etc., data, etc. and in which writing/read-out is free, and controls the operation of an electronic endoscope at large.
[0021] Moreover, if the memory read-out circuit 30 prepares in the picture signal processing unit 12 and ** and a scope 10 are connected with the picture signal processing unit 12, EEPROM26 will be connected to a system controller 28 through the memory read-out circuit 30, a system controller 28 reads the information data in EEPROM26 through the memory read-out circuit 30 this time, and storing maintenance is carried out temporarily [the information data] in RAM in a system controller 28.
[0022] Furthermore, the video signal processing circuit 32 and the timing generator 34 which controls operation of this video signal processing circuit 32 are formed in the picture signal processing unit 12. The video signal processing circuit 32 includes CCD process circuit 32A, an analog / digital (A/D) converter 32B, and frame memory 32C. A timing generator 34 controls operation of the video signal processing circuit 32 by the bottom of control of a system controller 28. The video signal processing circuit 32 is connected to the CCD driver circuit 24 at the time of connection of the scope 10 to the picture signal processing unit 12, and the analog pixel signal for one frame of each color read from CCD series 14 with the CCD driver circuit 24 is sent to the video signal processing circuit 32 one by one, and after processing suitably there, it is outputted from this video signal processing circuit 32 as a color video signal (R, G, B).
[0023] If it explains in full detail, the analog pixel signal for one frame of each color read from CCD series 14 with the CCD driver circuit 24 will first receive image processings various by CCD process circuit 32A, for example, white balance processing, a gamma correction, profile emphasis processing, etc. About the white balance processing especially relevant to this invention, it is carried out by integrating the analog pixel signal for one frame of each color by the correction-factor data prepared for every color. Various image processings are performed according to the clock pulse outputted from a timing generator 34 to CCD process circuit 32A, and it opts for them about the frequency of the clock pulse based on the frequency data read from EEPROM26.
[0024] The analog pixel signal for one frame of each color which received the image processing suitably by CCD process circuit 32A is outputted to A/D-converter 32B. The analog pixel signal for one frame of each color is changed one by one into a digital pixel signal by A/D-converter 32B, and the digital pixel signal for one frame is written in the predetermined field of frame memory 32C. That is, the red memory storage which stores the red digital pixel signal for one frame, the green memory storage which stores the green digital pixel signal for one frame, and the blue memory storage which stores the blue digital pixel signal for one frame are contained in frame memory 32C, and the digital pixel signal for one frame of an applicable color is stored in each memory storage.
[0025] About the conversion to the digital pixel signal in A/D-converter 32B from an analog pixel signal, it is carried out based on the write-in clock pulse which is performed based on the sampling clock pulse outputted from a timing generator 34 to this A/D-converter 32B, and is outputted from a timing generator 34 to frame memory 32C about the writing of the digital pixel signal to frame memory 32C. The frequency of a sampling clock pulse

and a write-in clock pulse is decided based on the frequency data obtained from EEPROM26.
[0026] On the other hand, a clock pulse is also outputted, a digital pixel signal is read from the memory storage of each color of frame memory 32C based on this read-out clock pulse, at this time, a field distinction signal, a horizontal synchronizing signal, a vertical synchronizing signal, etc. are outputted suitably, and read [it reads from a timing generator 34 to frame memory 32C, and] from a timing generator 34, and it is added to a digital pixel signal. In short, in case a digital pixel signal is read from the memory storage of each color of frame memory 32C, this digital pixel signal is outputted as a digital video signal. The frequency of a read-out clock pulse as well as the case of the frequency of a write-in clock pulse is decided based on the frequency data obtained from EEPROM26. The red digital video signal (R), green digital video signal (G), and blue digital video signal (B) which are outputted from frame memory 32C are inputted into the video process circuit 36.
[0027] If drawing 2 is referred to, the detailed block diagram of the video process circuit 36 will be shown, and the character processing circuit 37 will be established in the video process circuit 36 so that clearly from this drawing. A Video RAM is built in the character processing circuit 37, and the adjustable character code information data inputted from the fixed character code information data read from ROM of a system controller 28 or a keyboard (not shown) are once written in the predetermined address of the Video RAM of the character processing circuit 37. In the character processing circuit 37, a character-pattern signal is generated based on the character code information data written in the Video RAM.
[0028] As shown in drawing 2 , the digital adders 38R, 38G, and 38B, the digital one / analog (D/A) converters 40R, 40G, and 40B, and low pass filters (LPF) 42R, 42G, and 42B are further formed in the video process circuit 36. The digital video signal (R, G, B) in three primary colors from a video signal processing circuit and the character-pattern data signal from the character processing circuit 37 are inputted into each of the digital adders 38R, 38G, and 38B, and a character-pattern signal is added to a digital video signal (R, G, B) in three primary colors there. After the digital video signal (R, G, B) in three primary colors which added the character-pattern signal is changed into an analog video signal in three primary colors by D/A converters 40R, 40G, and 40B and subsequently passes through LPF 42R, 42G, and 42B by them, it is outputted to the TV monitoring device 44 (drawing 1), and the color image based on an analog video signal there in three primary colors is reproduced.
[0029] At the time of reappearance of the color image in the TV monitoring device 44, digital conversion machine 38R, Although alphabetic information is also displayed based on the character-pattern signal added by 38G and 38B and the fixed alphabetic information concerning [such alphabetic information] adjustable alphabetic information and reappearance color images, such as a patient name, medical examination time, and a medical examination brief review, is included As alphabetic information especially relevant to this invention, four fixed alphabetic information, for example, "preparation of a white balance setup was completed", Four messages of "a white balance setup having been completed", "registering this scope", and "reconfiguration of a white balance being required" are mentioned. These messages, i.e., fixed alphabetic information, are beforehand stored in ROM of a system controller 28 as code data, as mentioned above, and these code data are read from ROM of a system controller 28 if needed, and are written in the Video RAM of the character processing circuit 37. In addition, about the meaning of four messages mentioned above, it is clarified by the below-mentioned publication.
[0030] If it returns and explains to drawing 1 again, according to this invention, a system controller 28 will be equipped with non-volatile memory (EEPROM) 46, for example, the memory only for read-out in which a rewrite is possible, and this EEPROM46 will be connected to a system controller 28 through memory write / read-out circuit 48. Each information data of two or more scopes (10) which constitute the electronic endoscope system by this invention are written in EEPROM46 by the system controller 28 through memory write / read-out circuit 48, and predetermined information data are read from EEPROM46 to it by the system controller 28 through memory write / read-out circuit 48 if needed.
[0031] When drawing 3 is referred to, an example of a format of EEPROM46 is illustrated typically, as shown in this drawing, the memory storage of EEPROM46 is classified into two or more partition field 46A, and each partition field 46A is four more subdivision fields 46A1, 46A2, and 46A3. And

46A4 It is classified. It is assigned to each scope (10) and each partition field 26A is the subdivision field 46A1. And 46A2 Scope name data and manufacture serial number data are written in each as scope specific information data of the applicable scope, and it is the subdivision field 46A3. And 46A4 The registration date data of a scope and the correction-factor data for white balance processing are written in each.

[0032] Scope name data are shown by "SCOPE1", "SCOPE2", "SCOPE3", "SCOPE5", etc. in the example shown in drawing 3 , and serial-number serial number data are shown by "000001", "000003", "000013", "000021", "000005", etc. in it. As a registration date, 2 figures and days and months are shown under A.D., about the correction-factor data for white balance processing, it is "R= 124" about the thing to a red analog pixel signal, and is "G= 108" about the thing to a green analog pixel signal, "B= 120" shows the thing to a blue analog pixel signal, and these numeric values are equivalent to the gain (gain) of a non-illustrated video amplifier. In addition, about the writing of the data to EEPROM46, it is carried out at the time of a white balance correction-factor setup of each scope so that it may mention later.

[0033] To be shown in drawing 1 , the light source lamp 20 is connected to a system controller 28 through the lamp power circuit 50, and the electric supply to the light source lamp 20 from the lamp feeder circuit 50 is controlled by the system controller 28. Moreover, a control panel 52 is formed in the picture signal processing unit 12, and a various annunciator and various various switches are formed in this control panel 52. In addition, the electric power switch which changes ON/OFF of the main power supply (not shown) of the picture signal processing unit 12 as a switch relevant to this invention especially in drawing 1 (SW), The lighting switch which controls lighting of the light source lamp 20 (SW), The white balance configuration switch (SW) at the time of setting up the mode change-over switch (SW) and white balance correction factor which change the usual operating mode and usual white balance setting mode of an electronic endoscope is shown by reference marks 54, 56, 58, and 60, respectively.

[0034] If drawing 4 is referred to, the flow chart of the white balance configuration routine performed by the system controller 28 is shown, and after the execution start turns on an electric power switch 54, it will be performed by choosing white balance setting mode by the mode change-over switch 58. In addition, it is carried out when reconfiguring a white balance about the scope already used with the electronic endoscope system by this invention when a scope new after delivery of the electronic endoscope system by this invention when the electronic endoscope system by this invention is newly supplied to medical institutions, such as a hospital, etc. about a setup of a white balance, for example is added.

[0035] At Step 401, it is judged whether the light source lamp 20 was turned on by ON of the lighting switch 56. If lighting of the light source lamp 20 is checked at Step 401, it will progress to Step 402 and it will be judged whether the predetermined time after lighting of the light source lamp 20 passed there. Namely, it will be in a standby state until the luminescence state of the light source lamp 20 is stabilized. After the luminescence state of the light source lamp 20 is stabilized, it progresses to Step 403 and the message of the purport which preparation of a white balance setup completed there, for example, the message "preparation of a white balance setup was completed", is displayed on the TV monitoring device 44.

[0036] At Step 404, it is judged whether the scope (10) was connected to the picture signal processing unit 12. If connection of a scope is checked, it will progress to Step 405 and it will be judged whether it is the no by which the white balance configuration switch 60 was turned on there. The white balance configuration switch 60 is turned on by an operator's manual operation after completion of setting preparation of a white balance. Here, if setting preparation of a white balance is described briefly, a white balance setup will be performed by using an envelopment object with a reference white. That is, a predetermined reference white will be applied to the paries medialis orbitae of this envelopment object, it will get down, and setting preparation of a white balance will be completed by inserting the nose of cam of a scope (10) in the envelopment inside of the body. In addition, the setup of the white balance in an electronic endoscope itself is common knowledge.

[0037] If ON of the white balance configuration switch 60 is checked at Step 405, it will progress to Step 406, scope specific information data, i.e., scope name data, and manufacture serial number data will be read from EEPROM26 of a connection scope there, and it will be held in RAM of a system controller 28. Subsequently, at Step 407, it is judged for whether the thing corresponding to the read-out scope specific information data is stored

in ** EEPROM 46, and a connection scope whether it is un-registering.
[0038] When having not registered an applicable connection scope, it progresses to Step 408 and reads there, and scope specific information is the subdivision field 46A1 of intact partition field 46A of EEPROM46. And 46A2 It is written in, respectively. Subsequently, subdivision field 46A3 of the partition field 46A with the date data (namely, date which is going to register a connection scope) concerned above-mentioned with Step 408 It is written in. In addition, the data obtained from the clock (calendar) function built in the system controller 28 as the date data concerned are used.
[0039] On the other hand, in Step 407, when it is checked that a connection scope is already registered (i.e., when the scope specific information of the connection scope is already registered into predetermined partition field 46A), it skips to Step 409 from Step 407, and it is the subdivision field 46A3 of the partition field 46 there predetermined [this]. Date data are updated by the date data concerned.
[0040] At Step 410, an analog pixel signal is read from CCD series 14, and white balance correction-factor data calculate based on the analog pixel signal and the analog pixel signal acquired from the reference white. In addition, it is carried out from the former about the operation of such white balance correction-factor data.
[0041] The result of an operation obtained at Step 410 in Step 411, i.e., white balance correction-factor data, is the subdivision field 46A4 of applicable partition field 46A of EEPROM46. It is written in. In addition, when a connection scope is already registered, it is the subdivision field 46A4. White balance correction-factor data are rewritten and updated. Subsequently, the message of the purport which a white balance setup completed, for example, the message "a white balance setup was completed", is expressed to the TV monitoring device 44 as Step 412.
[0042] At Step 413, it is supervised [which it is supervised whether it was exchanged in the scope and it depends on the mode change-over switch 58 at Step 414 continuously] whether the change to an operating mode was usually performed. It replaces with the scope which reconfiguration of the scope which registration ended, or a white balance ended, and if it is checked at Step 413 that the non-registered scope or the required scope of reconfiguration of a white balance has been connected to the picture signal processing unit 12, it will return from Step 413 to Step 405, and the routine which consists of Step 405 or 414 will be repeated again. On the other hand, if the change to the usual operating mode by the mode change-over switch 58 is checked at Step 414, it will return to the main operation routine of an electronic endoscope.
[0043] It is possible to also make the electronic endoscope system by this invention coexist with the conventional electronic endoscope system, the white balance correction-factor data obtained at Step 410 in this case are written in EEPROM24 of a connection scope, and the white balance correction-factor data (written in at the time of the factory shipments) held at EEPROM24 of this connection scope are updated.
[0044] Reference of drawing 6 shows the flow chart of the white balance correction-factor data read-out routine performed by the system controller 28. This white balance correction-factor data read-out routine is performed every, whenever a scope (10) is connected to the picture signal processing unit 12. That is, if a scope is connected to the picture signal processing unit 12, an interrupt signal will be inputted into a system controller 28, and, thereby, a white balance correction-factor data read-out routine will be performed.
[0045] At Step 601, information data are read from EEPROM26 of the scope (10) connected to the picture signal processing unit 12, and it is stored in RAM of a system controller 28. Subsequently, at Step 602, collating of whether based on the scope specific information data of the read-out information data (namely, scope name data and manufacture serial number data) and the registration data (drawing 3) of EEPROM46, the connection scope is already registered is performed.
[0046] If registration of a connection scope is checked at Step 602, it will progress to Step 603, the registration date data of this connection scope will be read from EEPROM46 there, and the days difference of the registration date data and date (date which the scope connected) concerned will calculate. Subsequently, at Step 604, it is judged whether the days difference is less than the predetermined days decided beforehand. If a days difference is less than predetermined days, it progresses to Step 605, the white balance correction-factor data of a connection scope are read from EEPROM46 there, and

it is stored in RAM of a system controller 28. Then, it returns to the main operation routine of an electronic endoscope, and the white balance correction-factor data applied in case white balance processing of the analog pixel signal acquired from CCD series 14 there is carried out are used.
[0047] When it carries out also at Step 602 and the connection scope is not registered, it progresses to Step 606 from Step 602, and the message of a purport which should register a connection scope there, for example, a message which is said ["please register this scope" and], is displayed on the TV monitoring device 44. Then, although it will return to the main operation routine of an electronic endoscope, when registration of a connection scope is not immediately performed at this time, the white balance correction-factor data (what was written in at the time of the factory shipments) stored in EEPROM24 of this connection scope will be used at the time of white balance processing.
[0048] Moreover, when a days difference is judged to be more than predetermined days at Step 607, it progresses to Step 609 from Step 607, and the message of the purport to which reconfiguration of a white balance is urged there, for example, the message "reconfiguration of a white balance is required", is displayed on the TV monitoring device 44. Subsequently, it progresses to Step 605, the white balance correction-factor data of a connection scope are read from EEPROM46 there, and it is stored in RAM of a system controller 28. When not reconfiguring a white balance immediately after the message indicator of the purport to which an operator urges reconfiguration of a white balance, these read-out white balance correction-factor data will be used at the time of white balance processing. Of course, when reconfiguration of the white balance of a connection scope is performed according to the white balance configuration routine of drawing 4 according to this message, white balance processing with the newest white balance correction-factor data is attained.
[0049]
[Effect of the Invention] In the electronic endoscope system by this invention, it is possible to perform always proper white balance processing to the analog pixel signal acquired from each scope, and the color-reproduction nature of the endoscope image by the electronic endoscope can be maintained high-definition so that clearly from the above publication.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the electronic endoscope used with the electronic endoscope system by this invention.
[Drawing 2] It is the detailed block diagram of the video process circuit shown in drawing 1 .
[Drawing 3] It is the ** type view showing in instantiation the format of EEPROM in the picture signal processing unit of the electronic endoscope shown in drawing 1 .
[Drawing 4] It is the flow chart which shows a part of white balance configuration routine performed by the system controller of the picture signal processing unit shown in drawing 1 .
[Drawing 5] It is the flow chart which shows the remaining portion of the white balance correction-factor data read-out routine performed by the system controller of the picture signal processing unit shown in drawing 1 .
[Drawing 6] It is the flow chart which shows the white balance correction-factor data read-out routine performed by the system controller of the picture signal processing unit shown in drawing 1 .
[Description of Notations]
10 Scope
12 Picture Signal Processing Unit
14 CCD Series
20 Light Source Lamp
24 CCD Driver Circuit
26 EEPROM
28 System Controller
30 Memory Read-out Circuit
32 Video Signal Processing Circuit
32A CCD process circuit
32B An analog / digital (A/D) conversion circuit
32C Frame memory

34 Timing Generator
36 Video Process Circuit
37 Character Processing Circuit
38R.38Gand38B Digital adder
40R.40Gand40B Digital one / analog (D/A) converter
42R.42Gand42B Low pass filter (LPF)
46 EEPROM
48 Memory Write / Read-out Circuit

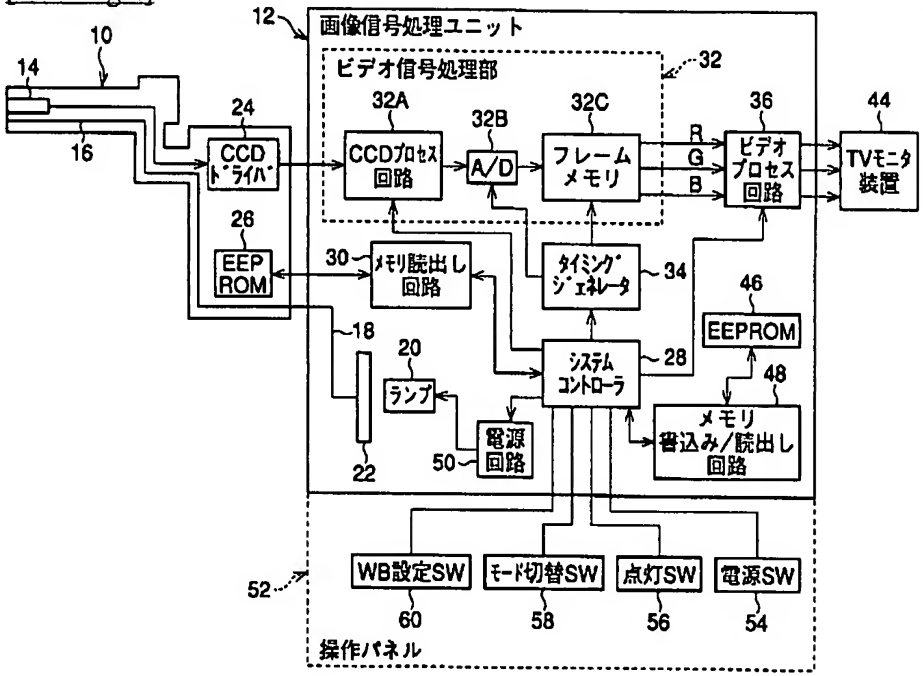
[Translation done.]

* NOTICES *

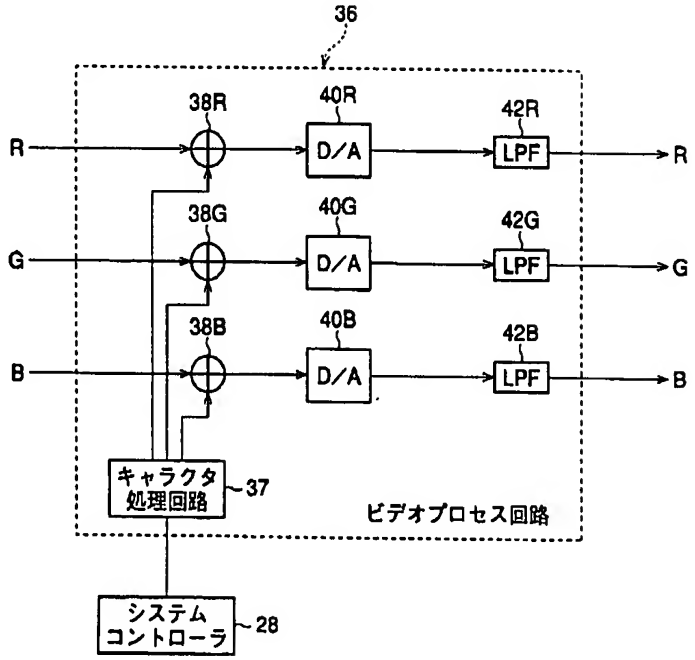
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

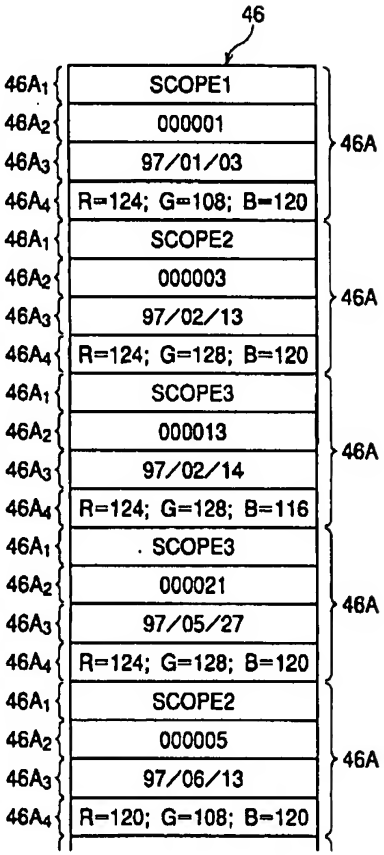
[Drawing 1]



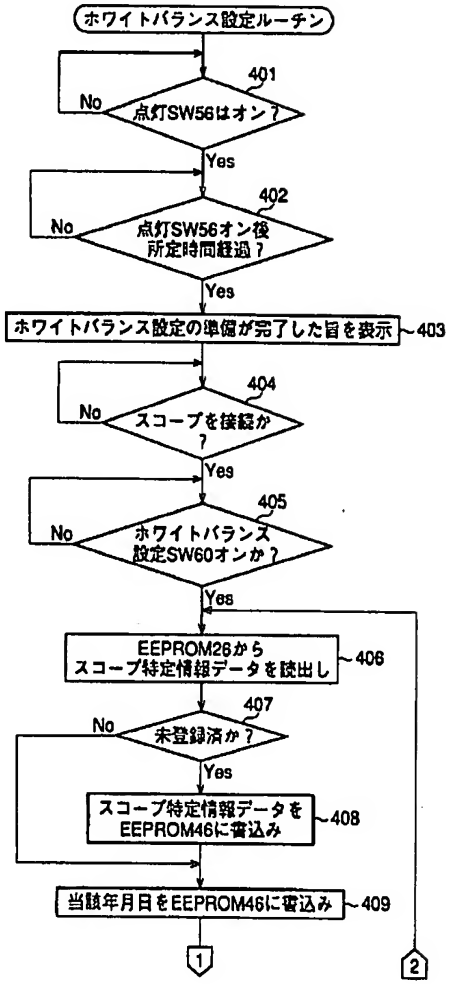
[Drawing 2]


36
38R
40R
42R
R
D/A
LPF
R
38G
40G
42G
G
D/A
LPF
G
38B
40B
42B
B
D/A
LPF
B
キャラクタ
処理回路
37
ビデオプロセス回路
システム
コントローラ
28

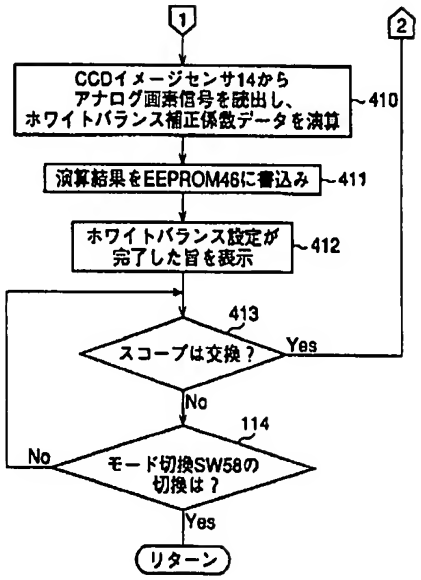
[Drawing 3]


46
46A1
SCOPE1
46A2
000001
46A3
97/01/03
46A4
R=124; G=108; B=120
46A
46A1
SCOPE2
46A2
000003
46A3
97/02/13
46A4
R=124; G=128; B=120
46A
46A1
SCOPE3
46A2
000013
46A3
97/02/14
46A4
R=124; G=128; B=116
46A
46A1
SCOPE3
46A2
000021
46A3
97/05/27
46A4
R=124; G=128; B=120
46A
46A1
SCOPE2
46A2
000005
46A3
97/06/13
46A4
R=120; G=108; B=120
46A

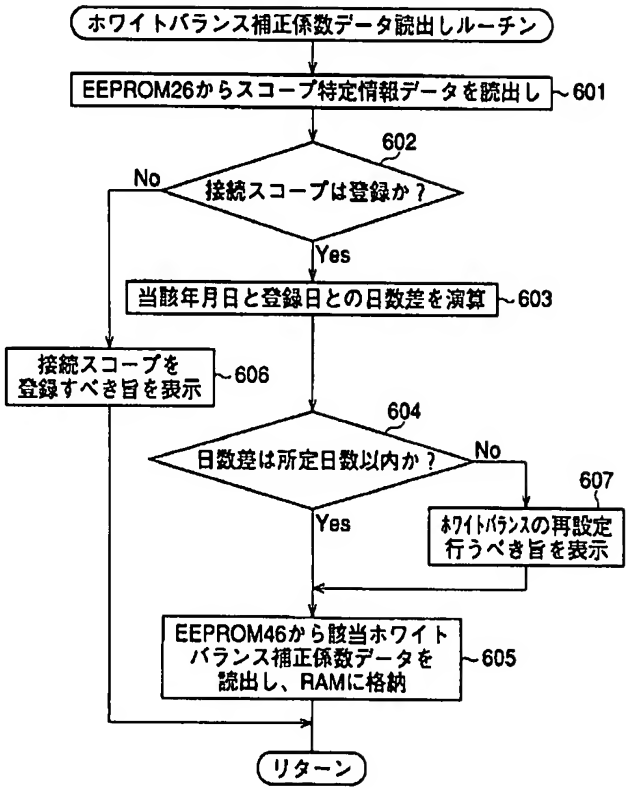
[Drawing 4]


ホワイトバランス設定ルーチン
401
No
点灯SW56はオン？
Yes
402
No
点灯SW56オン後
所定時間経過？
Yes
ホワイトバランス設定の準備が完了した旨を表示
403
404
No
スコープを接続か
？
Yes
405
No
ホワイトバランス
設定SW60オンか？
Yes
EEPROM26から
スコープ特定情報データを読出し
406
407
No
未登録済か？
Yes
スコープ特定情報データを
EEPROM46に書込み
408
当該年月日をEEPROM46に書込み
409
1
2

[Drawing 5]


1
2
CCDイメージセンサ14から
アナログ画素信号を読出し、
ホワイトバランス補正係数データを演算
410
演算結果をEEPROM46に書込み
411
ホワイトバランス設定が
完了した旨を表示
412
413
スコープは交換？
Yes
No
114
No
モード切換SW58の
切換は？
Yes
リターン

[Drawing 6]



[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of the amendment by the convention of 2 of Article 17 of patent law.
[Section partition] The 3rd partition of the 7th section.
[Date of issue] April 12, Heisei 14 (2002. 4.12)

[Publication No.] JP,11-298907,A.
[Date of Publication] October 29, Heisei 11 (1999. 10.29)
[**** format] Open patent official report 11-2990.
[Filing Number] Japanese Patent Application No. 10-99145.
[The 7th edition of International Patent Classification]

H04N 9/04

A61B 1/04 372
G02B 23/24
H04N 5/225
7/18
9/73

[FI]

H04N 9/04 B
C
A61B 1/04 372
G02B 23/24 B
H04N 5/225 C
7/18 M

9/73 A

[Procedure revision]
[Filing Date] December 19, Heisei 13 (2001. 12.19)
[Procedure amendment 1]
[Document to be Amended] Specification.
[Item(s) to be Amended] 0009.
[Method of Amendment] Change.
[Proposed Amendment]
[0009]
[Means for Solving the Problem] The electronic endoscope system by this invention consists of two or more scopes and a picture signal processing unit which it may have came to connect free [attachment and detachment of each of these scopes], the solid-state image pck-up means for making a pixel signal carry out photo electric translation of the optical photographic subject image to each scope is established, and the video signal processing means for generating a video signal based on a pixel signal is prepared in a picture signal processing unit. Each scope possesses a scope side memory means to store the scope specific information data for specifying it confidence. A unit side memory means by which a picture signal processing unit stores the white balance correction-factor data corresponding to scope specific information data and each scope specific information data about each of two or more scopes, When arbitrary scopes are connected to a picture signal processing unit, scope specific information data are read from the scope side memory means, and a distinction means to distinguish whether the thing applicable to the read-out scope specific information data is stored in the unit side memory means is provided. the pixel signal acquired from the solid state image pickup device of arbitrary scopes when what reads by the distinction means and corresponds to scope specific information data was stored in the unit side memory means and it was distinguished -- receiving -- the scope mystery e -- white balance processing based on the white balance correction-factor data corresponding to information data is performed four to 4c1 law

---

[Translation done.]